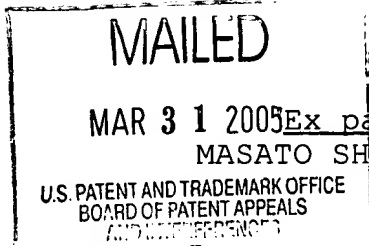


The opinion in support of the decision being entered today was not written for publication in a law journal and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES



Ex parte TOSHIHIKO TAGUCHI, SATORU AKITA,  
MASATO SHIMAMURA, RYOICHI SUZUKI and TETSUYA OKUNO

Appeal No. 2005-0867  
Application No. 09/642,765

ON BRIEF

Before KIMLIN, WARREN and KRATZ, Administrative Patent Judges.  
KIMLIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1-24, all the claims in the present application.<sup>1</sup> Claims 1 and 3 are illustrative:

1. A lead-free solder paste including a plurality of different types of metal powder mixed with a flux, one of the metal powders being a Sn alloy powder, another of the metal powders being selected from a Sn alloy powder, elemental Ag powder, elemental Cu powder, and elemental Sn powder,

each Sn alloy powder including 0 - 8 mass % of Ag, 0 - 5 mass % of Cu, and at least 80 mass % of Sn, the plurality of metal

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<sup>1</sup> Subsequent to the final rejection (Answer, page 10), the examiner found that claims 17, 21 and 22 would be allowable, and free of objection, if rewritten in independent form.

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powders having a composition when melted of 1 - 5 mass % Ag, at least 0.5 and less than 3 mass % Cu, and a remainder of Sn.

3. A lead-free solder paste including a plurality of different types of metal powder mixed with a flux, the plurality of metal powders including two different Sn alloy powders, each Sn alloy powder including 0 - 8 mass % of Ag, 0 - 5 mass % Cu, and at least 80 mass % of Sn, the plurality of metal powders having a composition when melted of 1 - 5 mass % Ag, 0.5 - 3 mass % Cu, and a remainder of Sn.

The examiner relies upon the following references as evidence of obviousness:

Seelig et al. (Seelig)	5,352,407	Oct. 4, 1994
Kazem-Goudarzi et al. (Kazem-Goudarzi)	5,540,379	Jul. 30, 1996
Paruchuri et al. (Paruchuri)	5,928,404	Jul. 27, 1999
Sakai et al. (Sakai)	6,077,477	Jun. 20, 2000
Hitch et al. (Hitch) (PCT Int'l Application)	WO 97/09455	Mar. 13, 1997

Appellants' claimed invention is directed to a lead-free solder paste comprising different types of metal powders mixed with a flux. Appealed claim 1 recites that one of the metal powders is an Sn alloy powder, while the other metal powder is selected from an Sn alloy powder or an elemental powder of either Ag, Cu or Sn. Appealed claim 3 defines the plurality of different types of metal powder as including two different Sn alloy powders.

The appealed claims stand rejected under 35 U.S.C. § 103(a) as follows:

- (a) claims 1 and 2 over Paruchuri;
- (b) claims 1-16, 18-20, 23 and 24 over Paruchuri in view of Sakai;
- (c) claims 1-16, 18-20, 23 and 24 over Paruchuri in view of Hitch;
- (d) claims 3-12, 14-16, 18-20, 23 and 24 over Kazem-Goudarzi in view of Seelig and Sakai; and
- (e) claims 3-12, 14-16, 18-20, 23 and 24 over Kazem-Goudarzi in view of Seelig and Hitch.

We have thoroughly reviewed the respective positions advanced by appellants and the examiner. For essentially those reasons expressed by the examiner, we will affirm the examiner's decision to deny patentability for the claims on appeal.

We consider first the examiner's rejection of claims 1 and 2 over Paruchuri. Like appellants, Paruchuri discloses a lead-free solder paste comprising an Sn alloy powder and a powder of elemental copper. Although Paruchuri teaches copper in an amount of 3-10%, we agree with the examiner that it would have been obvious for one of ordinary skill in the art to employ less than 3% copper, e.g., 2.99%, as presently claimed, with the reasonable expectation that the resultant solder paste would exhibit essentially the same characteristics as one containing 3% copper.

It is well settled that where patentability is predicated upon a change in a condition of a prior art composition, such as a change in concentration or the like, the burden is on the applicant to establish with objective evidence that the change is critical, i.e., it leads to a new, unexpected result. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990); In re Ranier, 377 F.2d 1006, 1010, 153 USPQ 802, 805 (CCPA 1967); In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In the present case, appellants have failed to advance the requisite evidence which demonstrates that amounts of copper near the upper limit of the claimed range result in an unexpectedly superior solder paste.

We also concur with the examiner that the subject matter of claims 1-16, 18-20, 23 and 24 would have been obvious to one of ordinary skill in the art over the combined teachings of Paruchuri and Sakai. Initially, inasmuch as we affirm the examiner's § 103 rejection of claims 1 and 2 over Paruchuri, alone, it necessarily follows that we will sustain the rejection of claims 1 and 2 over Paruchuri in view of Sakai. As for independent claim 3, appellants' principal argument is that whereas claim 3 requires two different Sn alloy powders, Paruchuri teaches the combination of a primary alloy powder and

an additive metal powder in elemental, not alloy, form. Appellants maintain that when Paruchuri is read in its entirety, the disclosure at column 5, lines 8-12 of "an additive power of tin . . . silver . . . copper . . . or combinations thereof" should be interpreted as combinations of elemental tin, silver and copper, and not alloys thereof. We disagree.

Appellants overlook pertinent disclosures of Paruchuri in their attempt to place specific disclosures in context. For instance, in the Abstract, Paruchuri describes primary solder powder and an additive metal powder and teaches that the metal powders may be a metal alloy. Also, at column 3, lines 42 et seq., the reference discloses that the metal powders of the primary powder and the additive powder may be either elemental metal or a metal alloy. Consequently, we find that one of ordinary skill in the art would have reasonably interpreted Paruchuri as teaching a lead-free solder paste comprising a combination of two different Sn alloy powders. Furthermore, the present specification acknowledges that it was known in the art to formulate a solder paste comprising at least two types of Sn alloy powders (see page 4, lines 12-17 of specification). As for the claimed amount of copper, Sakai provides additional evidence that it would have been obvious for one of ordinary skill in the

art to use less than 3% copper in an Sn-containing alloy powder for a lead-free solder paste. While appellants contend that "there is no teaching in Sakai that a lower copper content in any way contributes to fatigue strength, which is the major objective of Paruchuri" (page 16 of principal brief, fourth paragraph), we again note that appellants have furnished no objective evidence which establishes any advantage of using slightly less than the 3% copper disclosed by Paruchuri.

We will also sustain the examiner's § 103 rejection of claims 1-16, 18-20, 23 and 24 over Paruchuri in view of Hitch for essentially the same reasons discussed above and those stated by the examiner. Hitch simply provides further evidence that it was known in the art to use a lead-free solder alloy comprising Sn, Ag and less than 3% copper. Also, not mentioned above is the fact that Paruchuri expressly discloses that "[t]he primary powder is the same as is used in conventional solder paste" (column 3, lines 47-48). Accordingly, we find that one of ordinary skill in the art would have understood that the primary powder of Paruchuri may include less than 3% copper, as urged by the examiner. Both Sakai and Hitch evidence that it was known in the art to use a lead-free solder alloy of Sn having less than 3% copper.

Finally, with the exception of claims 20 and 24, we will sustain the examiner's rejection over Kazem-Goudarzi in view of Seelig and either Sakai or Hitch. We concur with the examiner that the collective teachings of the cited prior art would have made it obvious for one of ordinary skill in the art to eliminate lead from the alloy of Kazem-Goudarzi in formulating a lead-free solder paste within the scope of the appealed claims. While appellants argue that "Seelig does not teach anything about employing an Sn-Ag-Cu alloy" (page 37 of principal brief, second paragraph), the examiner properly notes that Seelig is cited simply for the proposition that there was motivation in the art to eliminate lead from solder paste. The obviousness of the particular alloys utilized by appellants is established by the other cited art. As for the requirement in claims 20 and 24 of completely melting the plurality of metal powders in a single reflow step, we agree with the arguments set forth by appellants in their principal brief, and repeated in their Reply Brief, that Kazem-Goudarzi only melts both powders during the second reflow step. While the examiner maintains that Kazem-Goudarzi completely melts the metal powders in a single reflow step, namely, the final reflow step, the examiner has apparently overlooked the fact that the final reflow step of the reference

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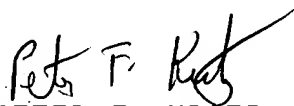
does not affect a plurality of metal powders (see page 21 of Answer, first paragraph).

As a final point, as noted above, we observe that appellants base no argument upon objective evidence of nonobviousness, such as unexpected results, which would serve to rebut the prima facie case of obviousness established by the examiner.

In conclusion, based on the foregoing, the examiner's decision rejecting the appealed claims is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv) (effective Sep. 13, 2004; 69 Fed. Reg. 49960 (Aug. 12, 2004); 1286 Off. Gaz. Pat. Office 21 (Sep. 7, 2004)).

AFFIRMED

  
EDWARD C. KIMLIN )  
Administrative Patent Judge )  
  
CHARLES F. WARREN )  
Administrative Patent Judge )  
  
PETER F. KRATZ )  
Administrative Patent Judge )

BOARD OF PATENT  
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Application No. 09/642,765

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